General context of the French higher education and the French - Russian university cooperation in aerospace:
status, mechanisms and experiences

Mikhail Stepanov, ISAE-SUPAERO Toulouse
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mikhail.stepanov@isae-supero.fr
French higher education system

High School Diploma (Baccalauréat) → Bachelor → Bachelor's Degree (Licence) → Master's Degree: Master / Diplôme d'Ingénieur → PhD (Doctorat)

Preparatory Courses → « Grandes Ecoles » (3 years) → « Grandes Ecoles » (5 years) → National Competitive Exam. (Concours « Grandes Ecoles ») → International MSc → Advanced Master → PhD
## French and Russian higher education systems

### June 29, 2015: Signature of French-Russian agreement on mutual recognition of diplomas

<table>
<thead>
<tr>
<th>Grandes Ecoles</th>
<th>Universities</th>
<th>Bologna process curriculum</th>
<th>&quot;Spetsialist&quot; curriculum</th>
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</thead>
<tbody>
<tr>
<td>Years</td>
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</tr>
<tr>
<td>8</td>
<td>PhD 3</td>
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<td>7</td>
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<td>5</td>
<td>Cycle d'ingénieur 3</td>
<td>5</td>
<td>Master 2</td>
</tr>
<tr>
<td>4</td>
<td>Cycle d'ingénieur 2</td>
<td>4</td>
<td>Master 1</td>
</tr>
<tr>
<td>3</td>
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<td>3</td>
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*Also exists in 6 years*
Aerospace engineering higher education in France

- Grandes Ecoles specialized in aerospace eng, aeronautical eng, civil aviation
  - ISAE group: ISAE-SUPAERO (Toulouse), ISAE-ENSMA (Poitiers), ESTACA (Paris), EA (Salon de Provence)
  - ENAC (Toulouse)
  - IPSA (Paris, Toulouse)

- Grandes Ecoles with options or degrees in aerospace eng.
  - CentraleSupelec (Paris), Centrale (Lyon)
  - ENSAM (Bordeaux)
  - INP-ENSEEIHT (Toulouse), Telecom Bretagne (Brest) in space telecoms, EPF (Paris), EI CNAM (Paris) with ISAE-SUPAERO…others

- Grandes Ecoles with courses in aerospace eng or related domains
  - Ecole Polytechnique (Paris): courses under creation
  - INSA (Toulouse)
  - ENSEIRB-MATMECA (Bordeaux)…others
Universities, offering degrees, related to Aerospace eng. (source: GIFAS catalogue): DUT, bachelor and master

- Univ. Paris Pierre et Marie Curie: fluid mechanics, structures/materials...
- Univ. Toulouse Paul Sabatier: mechanics, materials, energetics, embedded systems
- Univ. Aix-Marseille: mechanics
- Univ. Bordeaux: maintenance
- International Space University (Strasbourg): space studies
- Others...

Universities, offering master degrees in Space science:
Universities Paris 6, Paris 11, Toulouse Paul Sabatier, Grenoble, Strasbourg...etc

Business schools (MBA)

- Toulouse Business School: Aerospace MBA
- HEC Paris: Executive MBA with major in Aerospace and Aviation
- Others...
Aerospace industry in France: 180,000 direct employees (GIFAS data, 31/12/14)

3 main French aerospace clusters:
- Astech
- Aerospace Valley
- Pegase
• 1909 : founded in Paris and moved to Toulouse in 1968
• Higher education and research institute
• Founding member of the University of Toulouse
• Engineer graduate program (master level), Masters of Science, post-graduate Advanced Masters, specialized certificates, short courses (EUROSAE subsidiary)
• International relations : 80+ cooperation agreements and 35 double degree programs
• Industrial relations : 15+ partnerships with aerospace companies
• 28% international students, 45 nationalities
French - Russian university cooperation in aerospace:

ISAE – SUPAERO experience
« Among the students, there are many foreigners, in particular Russians and the ambiance was very enjoyable » write Louis Coroller (class 1913) and Henry Potez (class 1911).

MIG-15 on ISAE campus

ISAE auditorium named after Nikolay Jukovsky

Russian cosmonauts visit ISAE: Alexei Leonov in 1966 and Vladimir Lyakhov in 1995
Students and professors exchanges

- Academic cooperation agreements with Russian universities:
  - Moscow Aviation Institute, Bauman Univ, Samara Aerospace Univ
  - Student mobility for 1 or 2 semesters, double degrees

- Participation of students in space summer schools

- Invited professors, giving conferences and lectures
  Ex. 2015: from Institute of Space Studies (IKI) and Saint-Petersburg Polytechnical University (SPbSPU) at ISAE-SUPAERO

- Participation to conferences
  Ex. 2014: ERBA conference by MIPT aeromechanics dept. (Fiztekh), ISAE-SUPAERO professor in program committee and head of section
Aerospace engineering training programs for Bachelors

- The « diplôme d’ingénieur » ISAE-SUPAERO (master level degree) :
  2 or 3 year program in French

- Master of Science in Aerospace engineering :
  2 year program in English

Scholarships : ISAE-SUPAERO foundation, IASE-SUPAERO industrial partners
- **Full time Advanced Masters**: 1 year professionally-oriented program (in English)

- Various origin of Russian students: IAS FASIA program, company funding, personal funding

- Aerospace / System engineering, Aerospace Project Management, Aeronautical Maintenance & Support, Aviation Safety Aircraft Airworthiness

- Alumnis with responsibility positions, e.g. in joint-ventures
  - Safran/NPO Saturn: Pavel Frelikh - Power Jet director, Vitaly Klochkov - VolgAero director

- **Part time ECATA training program for high potentials from aerospace companies** (in English)

  - 1 person from Safran Russia and 2 people from NPO Saturn (with support from Safran in the frame of partnership on Sam-146 engine of Sukhoi Superjet-100)

- Participation of auditors from Russia can be performed in the frame of industrial cooperation between Russian and French aerospace companies
Soyuz - CanSat : French-Russian student project in cooperation between ISAE-SUPAERO and Samara Arospace University

- 2 meter Russian rocket, launching a French atmospheric probe during the C’SPACE student event, organized by CNES (French Space Agency)

- Educational version of the project “Soyuz in Guiana”

- Technical, human and cultural challenge

- 2011 : Soyuz only (2 months before the real one !)
  2012, 2013 : Soyuz with 1 French CanSat
  2014, 2015 : Soyuz with 2 French and 1 Russian CanSats
Research projects / periods in laboratories

Univ. of aerospace instrumentation (Saint-Petersburg)
MIPT Fiztekh (Moscow)
French-Russian mathematical lab Poncelet (Moscow)
Institute for Information Transmission Problems (Moscow)

Russian students also carry out a research project in ISAE-SUPAERO labs

Co-directed PhD

ISAE SUPAERO has experience with Germany, Italy, Spain, UK, Brasil, China...

Research projects in cooperation
Internships in companies in Russia:
Safran Smartec (Samara)
SATURN (Rybinsk)
Lafarge (Moscow)

European Commission Tempus project: AirQUAL (2008)
Development of Qualification Frameworks for Cycles of Higher Education in Aircraft Engineering
Performed in cooperation between French (ISAE-ENSMA, ENAC), Russian (Kazan Aviation Institute, Samara Aerospace University, Ufa Aviation Institute) and several other European universities, institutions and industries
Numerous mechanisms for the development of French-Russian cooperation through education programs, common students projects, internships, research projects...

- Student mobility for semesters / double degrees have a high potential for progress
- Research projects in labs are an excellent way for cooperation (and possible in English!)

Benefits at various levels

- Personal: technical, linguistic and intercultural skills development
- Research: students exchanges allow to create links between universities, potentially leading to common research projects, co-directed PhD...etc
- Industry: excellent profiles for French-Russian aerospace industrial projects
Merci pour votre attention
Спасибо за внимание